City of Framingham



Community Resilience Building Workshop Summary of Findings

May, 2019





City of Framingham Community Resilience Building Workshop Summary of Findings

Overview

Extreme weather and natural and climate-related hazards are an increasing concern for the communities of Massachusetts, and there is a clear need to involve municipalities, corporations, organizations, and the State in increasing resilience at all levels. Recent storm events affecting the region have highlighted many of the vulnerabilities that towns and cities face. Hurricane Irene and Superstorm Sandy brought intense flooding to many municipalities and threatened (or destroyed) infrastructure across the state. Extreme temperatures at both ends of the spectrum have pushed the limits of communities' preparedness to protect both infrastructure and people. In coastal communities, the impacts of sea level rise are felt daily and further exacerbate the impacts of other extreme events. Current climate modeling indicates that all of these hazards are expected to increase in frequency and scale over the coming decades. The Municipal Vulnerability Preparedness (MVP) program provides support and a prescribed process for cities and towns in Massachusetts to plan proactively for resiliency and implement key climate change adaptation actions.

In 2018, the City of Framingham was awarded a \$44,500 MVP grant to fund the planning stage of this process, including funds to assess climate change impacts on vector-borne diseases. The City partnered with Fuss & O'Neill, a state certified MVP Provider, to complete a comprehensive, baseline climate change and natural hazard vulnerability assessment and develop a list of priority actions for the City. This process involved a project kickoff meeting on December 10, 2018 attended by some of the members who would later develop into the MVP Core Team, which met on January 15, 2019 to determine initial concerns and worked to identify stakeholders within the municipality and set goals for the process. Those stakeholders were then invited to participate in a Community Resilience Building (CRB) workshop on March 19, 2019, engaging in a day-long, tried and tested process developed by The Nature Conservancy. The CRB methodology is an "anywhere at any scale" format that draws on stakeholders' wealth of information and experience to foster dialogue about the strengths and vulnerabilities within the City. Workshop participants interacted at both large and small group levels, using an iterative process to gather input, synthesize ideas across groups, and ultimately develop a set of priority resilience and adaptation actions.

The CRB workshop's central objectives were to:

- Define top local natural and climate-related hazards of concern;
- Identify existing and future strengths and vulnerabilities;
- Develop prioritized actions for Framingham;
- Identify immediate opportunities to collaboratively advance actions to increase resilience.



Top Hazards and Vulnerable Areas

During the CRB Workshop, participants were asked to reflect on the potential impacts of the top four natural hazards of concern for the City of Framingham. Discussion of the top hazards built on earlier conversations that took place at the MVP Core Team Meeting, as well as the City's existing Multiple Hazard Mitigation Plan (2017). Flooding and the collective impacts of heavy precipitation and stormwater were identified as one of the City's top hazards. Severe storms bringing high winds and heavy, sometimes mixed, precipitation were identified as a second hazard. Extreme cold and hot temperatures, especially the increase in days over 90°F, was seen as a third major hazard. Finally, drought was identified as a fourth hazard. These four hazards have already had demonstrated impacts on the City, and as climate change progresses, these hazards are expected to have ever greater consequences for infrastructure and environment, as well as for various societal elements. Specific areas of concern are identified below.

Top Hazards

- Flooding
- Severe Weather
- Extreme Temperatures
- Drought

Areas of Concern

While many impacts are expected to be felt City-wide, certain elements, locations, or community groups present particular concerns.

Neighborhoods/Communities

Downtown, South Framingham, Pelham Apartments, Saxonville, Environmental Justice populations/neighborhoods, Hemenway Neighborhood, Walnut Street, Auburn Street, Circle Drive.



Buildings and Facilities

Callahan Senior Center, Framingham State University, Framingham High School, Fuller Middle School, Framingham Housing Authority properties, Merchant Road Homeless Shelter, Learned Pond Beach, Waushakum Beach, Saxonville Beach.

Ecosystems

Learned Pond, Lake Cochituate, Sudbury Reservoir, Framingham Reservoirs, Cedar Swamp, Sudbury River, Beaver Dam Brook.

Infrastructure

Route 9/126 Intersection, Walnut St, Beaver St, Hemenway Rd, natural gas lines and electrical infrastructure, sewer pump stations, water supply reservoirs, the "T" Commuter rail line, Concord St flood gate, culverts, Central Street Dam, Landham Pond Dam.



Current Concerns and Challenges Presented by Hazards

Flooding is a severe hazard that frequently affects Framingham. The City has been experiencing an increasing regularity of storms, with the so-called ten and one hundred year storms now happening on an annual or near-annual basis. Intense storms occurring throughout the year are producing very high volumes of rain, causing rivers and streams to overflow their banks, putting significant pressure on dams, culverts, and other drainage infrastructure, and overwhelming the stormwater infrastructure system. Flooding frequently has City-wide impacts, including road closures at susceptible locations, such as the Route 9/126 intersection, where cars have been known to become stuck in floodwaters on many occasions (during one recent summer, workshop participants described that this happened three times in two weeks). Because of a high degree of impervious surfaces in the City, even moderate volumes of stormwater in Framingham can result in stormwater runoff that floods buildings and infrastructure. Around 2003 there was flooding that overtopped a headwall and caused damage to approximately a dozen homes. Certain neighborhoods are particularly susceptible to flooding and related power outages. Sixteen structures city-wide were identified in the City's Multiple Hazard Mitigation Plan (2017) as suffering repetitive losses from flooding, resulting in damages of nearly \$400,000.

Flooding also poses direct safety concerns and related challenges for the City's emergency management team. Emergency personnel have been trying to get training for swiftwater rescue, which is presently a weakness on their team, and an issue of increasing concern, given the increased frequency of flooding. The last time the City's shelters were really utilized was during a flooding event in 2005 during which police and fire were using boats to rescue residents and many had to shelter for three to four days.

In addition to concerns about heavy precipitation, Framingham residents face the potential impacts of more major storms, such as hurricanes and Nor'easters. Notable historic events include impacts from the Great Hurricane of 1938, but unlike hurricanes and tropical storms which occur with medium frequency and mainly during fall, winter storms are a high frequency hazard for the City. Framingham receives an average 40 to 50 inches of snowfall annually. High winds and accumulating precipitation threaten public safety, restrict economic activity, and disrupt transportation as streets become impassable. In 2015, there was too much snow for the T to operate, and messages went out seeking volunteers to shovel the tracks. The weight of ice and snow can pull down trees and powerlines and over-burden flat roofed buildings with excessive snow loads, causing them to collapse. Further, climate change is bringing new types of winter storms, where ice, snow, and rain may arrive in a single event, complicating the already challenging task of maintaining roads and keeping residents safe. In extreme cases, residents may be unable to leave their homes or receive assistance for many days at a time.

In recent years, Framingham residents have also observed extreme temperatures, bringing both extreme heat and extreme cold. In 2018, the City's libraries served as informal cooling centers, although there were no formal cooling centers opened, and the City extended hours of beaches and public cooling facilities in order to provide essential cooling services to local residents. Emergency personnel noted that medical calls related to heat waves have increased in the recent past. The incidence of vector-borne disease has also been on the rise in Framingham, which is directly linked to increasingly warm, wet summers, and an insufficient period of cold to kill off pest populations.

Framingham has also faced concerns related to drought and brushfires in recent years. In 2016, during a period of extended drought, there was a significant brush fire on the Nobscot Reservation owned by the Boy Scouts in the northwest corner of the City, which burned underground in tree roots, making it difficult to combat. The fire burned for seven days and required drones, as well as federal and state teams to help put it out. The City has obtained better equipment since then, adding a second forest fire/brush truck and



tanker to its fleet. During the same summer, a number of private wells in the northwest portion of the City dried up, again as a result of the extreme drought conditions.

Tornadoes have historically been virtually unheard of in Framingham, and are still considered to be a low-frequency hazard. Nonetheless, a representative from Eversource noted that last year tornadoes took down utility poles in their jurisdiction during the month of May in neighboring Connecticut, and there is concern about the link between climate change and the increased frequency of these more extreme weather events.

Specific Categories of Concerns and Challenges

Infrastructural

Culverts and Bridges

Culverts and bridges are a concern City-wide, particularly as Framingham's developed areas are in close proximity to the Sudbury River and several vulnerable brooks and wetlands. Existing culverts and bridges were designed to accommodate historic patterns of precipitation and runoff, but are rapidly becoming inadequate as a result of climate change. The intersection of Routes 9 and 126 is frequently closed by flooding caused by undersized drainage pipes downstream, and has been affected by even moderate amounts of rainfall for decades. While design standards have changed, the City's infrastructure largely predates such changes. As precipitation events become more intense and less predictable, undersized culverts are expected to pose a greater threat of failure and flooding. The fire station at 75 A Street (currently under construction) took three years to site due to concerns about flooding impeding access and impacting response times. Framingham is currently working to improve two undersized culverts near the intersection of A Street and Concord Street, and MassDOT recently replaced a bridge at Concord Street. There is not currently a systematic, detailed inventory that catalogs the size and condition of culverts and bridges City-wide.

Dams

There are ten dams in the City of Framingham. The largest of these create water supply reservoirs and are owned and operated by the Massachusetts Water Resources Authority (MWRA). Though not originally designed for flood control, the dams provide upstream flood storage and protect heavily populated, downstream areas where development along the Sudbury River would be threatened by floodwaters from a dam failure. Workshop participants recognized the critical importance of the upstream dams to the City. Most of the highest hazard dams are owned by MWRA and are generally kept in good condition. However, participants raised concerns about private dams, for which condition might be unknown. There was also concern about the dams that are outside the City limits, such as the Sudbury Reservoir Dam.

Roads

Roads in Framingham are vulnerable to flooding, in addition to the impacts of snow and ice. In general, shifting weather patterns due to climate change make it increasingly difficult to maintain and clear existing roadways. Potholes and sinkholes are becoming more problematic due to new patterns of freezing and thawing that occur repeatedly throughout the winter season. Roadways in the City are also susceptible to blockages from trees and power lines brought down by wind storms. These impacts in turn compromise the City's ability to provide emergency services. As climate change increases the frequency of weather-related risks, more focus on the prevention of hazard conditions is necessary to increase the resiliency of



the City's roads. The Framingham Department of Public Works (DPW) and salt shed are not centrally located, however, which can impact response time and effort in emergencies and severe weather. As identified in the CRB Workshop, the City has invested in some generators to power traffic lights and electronic signage in the event of a power outage. This investment helps safely manage traffic, providing information about alternative routes, and effectively evacuating residents from priority areas in an emergency. Additional consideration was given to regional evacuation routes for the homeless and elderly.

Water Supply and Water Infrastructure

Water supply for the City of Framingham comes primarily from the MWRA and the Quabbin Reservoir in Western Massachusetts. The City of Framingham is concerned about the resilience of its water resources, in particular, having enough water to sustain the City during extended drought. Participants noted that MWRA provides drought resistance and that the statewide restrictions in place in 2015 for much of the state were not in place in Framingham. In addition to the impact of drought on regular water supply, extended drought makes surrounding landscapes susceptible to wildfires, and may put additional strain on the City supply. The water supply aqueduct that carries water to the City from Quabbin and Sudbury Reservoirs are also a lesser concern, as the City is seen to benefit from its proximity to the water infrastructure that supplies a major metropolitan area. Finally, workshop participants expressed concern about water supply issues in the northwest portion of the City. This affluent area is primarily served by private wells and experienced problems with wells running dry during 2016. There are also no fire hydrants available in that portion of the City.

Stormwater Drainage Infrastructure

Stormwater infrastructure is recognized as a potential concern City-wide. Similar to culverts conveying natural streams, there is a general recognition that much of the stormwater drainage system was designed to accommodate historic patterns of precipitation and runoff, and may be undersized as climate and weather patterns continue to shift. The City's aging stormwater infrastructure exacerbates flooding potential during heavy rains. Further, development in Framingham has added to the amount of impervious area in the City, and in some cases decreased flood storage, which in turn has increased runoff and flooding potential. Drainage-driven flooding is a problem City-wide, but particular areas of concern include the intersection of Routes 9 and 126, Walnut Street, the Hemenway Neighborhood, Auburn Street, Circle Drive, Beaver Dam Brook, and many of the tributary brooks to the Sudbury River. The City's DPW is taking steps to improve stormwater drainage and reduce runoff through green infrastructure projects, including rain garden installations at locations like the City's Skate Park.

Emergency Operations

The City activates its Emergency Operation Center at the Police Department Headquarters during city-wide and large-scale emergencies. These facilities provide a place to run operations in case of an emergency and is equipped with backup power via a generator. In addition, the Massachusetts Emergency Management Agency and State Police headquarters are located along Route 9 in Framingham.

Underground Storage Tanks

Underground storage tanks exist on public and private land, City-wide, though the location and condition are not known for all tanks. The tanks are vulnerable to flooding and considered to be an area of concern for the City.

Buildings and Facilities

Energy reliability at buildings and facilities was a topic of concern among workshop participants. As the City moves toward electric power for efficiency improvements (heat pumps, etc.), there is concern that



electrical infrastructure is more vulnerable to hazards. In general, there is a desire to make facilities more energy independent. Critical facilities such as City Hall, school buildings, Housing Authority buildings, and the Callahan Senior Center are typically able to maintain power during a hazard-induced power outage due to their locations and electrical infrastructure. This allows many of these facilities to serve as warming/cooling centers. However, the Senior Center is unable to act as an official cooling center or shelter because its parking lot has only one egress route. The Senior Center parking lot has also historically been impacted by flooding, losing as many as 30 parking spaces to floodwaters. Snow loads on various public facilities, including the City Hall, are another topic of concern. The major facilities operated by the Housing Authority have back-up generators to maintain heating and cooling capabilities and keep elevators running for a temporary period but cannot operate on a prolonged, multi-day, 24-hour basis. In addition, 360 Housing Authority units on Arsenal Road have no cooling capabilities, making them subject to extra risk during extreme heat events.

Utilities Infrastructure

The City's private utility infrastructure is susceptible to a range of hazards. Power lines can be knocked out by snow and ice in addition to wind events, causing extensive but localized impacts to the City. Workshop participants recognized that impacts to the downtown power network that resulted in power outages would hinder economic activities and access to goods and services, critically important to the City and its residents. The City's partnership with Eversource is important in making power lines more resilient and in reducing consumption, and Framingham benefits from Eversource's tree trimming program. Extreme heat also stresses the electrical system, as increased use of air conditioning leads to a risk of brownouts and outages, particularly if heat impacts are region-wide. Though the impacts were less-widely discussed, the City's Eversource gas infrastructure may also be vulnerable to the impacts of flooding; further information is needed to fully identify the associated risks.

Wastewater Infrastructure

Severe storms bringing heavy precipitation can overwhelm the sewer system by inundating pipes and pump stations, and causing inflow and infiltration in various areas of the City. Kerry Reed, the City's Stormwater Engineer, noted that the City has 43 sewer pump stations at various low points throughout the City, some of which are likely vulnerable to flooding. The City has an ongoing infiltration and inflow program and is systematically working to tighten up their system. Wastewater infrastructure is also vulnerable to power outages, which may result in backups and sewer overflows if pump stations are shut down. Maintenance and upgrades to Framingham's wastewater infrastructure are ongoing, including an inflow and infiltration study, but further safeguards are needed at pump stations located in low areas across the City in order to ensure back-up power, flow control, and protection from flooding.

Environmental

Environmental Contaminants

Workshop participants raised questions about the location and extent of environmental contaminants that remain as legacy pollution from the City's industrial past and the potential negative impacts these contaminants could have on the City's vulnerable human communities, ecosystems, and wildlife. This is particularly pertinent as climate change threatens to mobilize latent contamination through increased heat or flooding risks. Specific concerns were raised with regard to contamination from industrial areas around Beaver Street.

Trees

Trees provide critical ecosystem services that help buffer the effects of climate change, from sequestering carbon, to increasing groundwater recharge, to modulating local temperature. Street trees within urban spaces are likewise critical for infiltration of rainwater and provision of shade. However, trees and forests



are also threatened by climate change, and loss of trees was identified as an issue in the City. Wind and storms cause blowdowns, drought can contribute to die-offs, new invasive pests (e.g. Emerald Ash Borer and Asian Longhorned Beetle which are already in the larger central Massachusetts region) are eliminating certain tree species, and others are in decline due to shifting temperature and precipitation regimes that favor more southerly species. Participants expressed interest in stewarding the City's trees, recognizing them as a form of valuable "environmental infrastructure." The City is currently in the process of completing the South Framingham Urban Forest Inventory and Management Plan for areas within downtown and south side neighborhoods. This Plan should be expanded upon.

Open Space

Open space provides many of the same resilience benefits and faces many of the same threats described above for trees. Framingham's open space includes an extensive network of parks, playgrounds and other open space that provides many social, environmental, and economic benefits to the City. Open space is critical in floodplains for providing a buffer and increased flood storage, near public water supplies to maintain high water quality and promote recharge, and to maintain overall habitat connectivity that will be vital to allowing ecosystems and individual species to adapt to a changing climate. Open space also provides important recreational opportunities and relief from stress. Participants noted that future open space acquisitions should continue to incorporate flood storage as a key decision factor.

Flood Storage

The City is threatened by the loss of flood storage capacity caused by historic and ongoing development and filling of wetlands and floodplains. Framingham has extensive development and critical infrastructure in highly vulnerable, low-lying areas. Cedar Swamp southwest of Downtown is one natural area in the City that offers some flood storage, but there is a need for strategies to increase flood water storage capacity in the City and implement green infrastructure approaches to increase resiliency. Areas along the Sudbury River and Beaver Dam Brook were noted as priority targets for improved riparian flood storage.

Invasive Species

Invasive plants and animals are a source of concern throughout the Commonwealth. Forest and upland ecosystems are threatened by a variety of invasive species, including plants such as oriental bittersweet, multiflora rose, two types of swallowwort, and several non-native honeysuckles. Riparian and aquatic habitats are severely threatened by common reed, Japanese knotweed, invasive water chestnut, hydrilla, purple loosestrife, and Eurasian milfoil. Critical invasive insect pests already in the larger region include the Asian Longhorned Beetle, Hemlock Wooly Adelgid, and Emerald Ash Borer, all of which have the potential to do serious damage (both environmental and economic) to Massachusetts' forests and trees. These and other species already pose a significant challenge and have serious consequences for ecosystem health and resilience, and these impacts are likely to increase in response to climate change. Warming temperatures will also bring new invasives to the area, and these will have an easier time gaining a foothold if the City's natural and urban ecosystems are simultaneously weakened due to changes in climatic conditions.

Stormwater Runoff

Patterns of urban growth and development in Framingham have resulted in extensive impervious surfaces, which prohibit stormwater infiltration and lead to issues with runoff. Participants at the workshop noted the increase in precipitation intensity has caused areas previously unaffected by flooding to become newly and regularly inundated. Stormwater runoff is recognized as an area of concern affecting both public and private properties City-wide, but the problem is particularly relevant at the intersection of Routes 9 and 126. Workshop participants recognize the value of the National Pollutant Discharge Elimination System (NPDES) municipal separate storm sewer systems (MS4) stormwater permit in



addressing stormwater runoff issues and mitigating polluted discharges affecting waterways and water quality, but also recognize the technical and financial challenges departments may face in implementing it. The City is also exploring a stormwater utility which would help to generate the necessary funding to implement strategies like green infrastructure retrofits.

Environmental Regulations

Participants noted the importance of governance and regulations for discouraging development within the City's flood zones, ensuring that new development and building construction meets improved permitting standards, and proactively addressing stormwater and flooding issues. The City recently strengthened its local wetlands and stormwater ordinance to provide additional protections to these sensitive environmental areas that play a crucial role in resiliency to climate impacts, particularly the effects of flooding. In particular, the City now maintains a 30-foot "no alteration" buffer, and a 50-foot "no build" buffer. The revised ordinance also gives the City more authority for enforcement and requiring alternatives analyses.

Societal

Public Transportation

Framingham has strong public transportation assets, which are critical to mobility during hazard events. The City's proximity to Boston and Central Massachusetts is seen as critical to the City's future development. The MetroWest Regional Transit Authority (MWRTA) provides bus service and the majority of its users are transit-dependent. The MWRTA has a compressed natural gas (CNG) fueling station that can assist the region in improving vehicle fuel efficiency and diversification of fuel sources. Maintaining public transportation options during emergencies and extreme weather helps ensure that residents who do not drive or own a car can evacuate hazard areas, obtain necessary provisions, or access critical services and medical care. In addition to those critical, short term objectives, the City also depends on its public transportation system to achieve long term objectives, such as allowing people to get to work and keeping businesses open whenever possible, despite hazardous weather. Workshop participants also recognized that encouraging the use of public transportation helps decrease greenhouse gas emissions from personal vehicles, and is a necessary step toward meeting the Commonwealth's goals for emissions reductions and helping to curb the effects of climate change. MWRTA operates an intermodal service hub to link bus service with MBTA commuter rail. Logan Express is also a key transportation service for the City's residents, but parking at the newly renovated Logan Express garage is already frequently exceeding capacity. There are plans to add an additional parking deck for increased service.

Framingham State University (FSU)

Dale Hamel, representing FSU at the workshop, indicated that the most pertinent role for the University with regard to climate change is its educational mission. The University can play a vital part in teaching young adults about the importance of adaptation and the need for new practices to protect the community from climate impacts. The University's role in recognizing this need and encouraging proactive, positive change is a large asset to Framingham. In terms of impacts, Framingham State has suffered some flooding in the past, but most discussion around the University centered around its value in supporting resiliency, rather than on impacts that would be felt by FSU.

Local Farms

Workshop participants noted that New England as a whole has a three to five day supply of food if the existing supply chain were to break down due to a hazard event. The few remaining farms in the northwestern part of Framingham were identified as an important local agriculture resource that could help support food resilience in the City.



Language Barriers

Framingham is home to diverse populations. 27 languages are spoken in South Framingham, and 54 languages are spoken in the City's schools. Other than English, there are six different languages that are spoken by more than 1% of the City's population, including: Spanish, Portugese, Hindi, Chinese, Russian, and Creole. Addressing potential language barriers as part of the City's emergency preparedness planning and response efforts was an area of particular concern. The City recognizes that hazard warnings and emergency updates should be accessible to, and easily understood by, all residents, including those who speak a first language other than English.

Residential Property

Certain neighborhoods within Framingham, such as South Framingham, are especially prone to flooding and have been experiencing problematic events for decades. Stormwater runoff from extended rainfall like that associated with recent precipitation events can cause local waterbodies to surge with large volumes of water moving at high velocity, increasing the threats to private property. Flooding of yards and basements at both residential and commercial properties continues to be a problem City-wide, and pumping of water out of basements onto the surrounding streets has been known to cause icing and associated road safety issues. The largest number of repetitive loss properties are on Walnut Street, but properties near Beaver Street, Auburn Street, Circle Drive, and the Hemenway Neighborhood have also experienced frequent flooding from stormwater. Workshop participants pointed out that the South Framingham neighborhood is not covered under FEMA's National Flood Insurance Program and that most of these properties are renter-occupied, so many of the losses experienced due to flooding have not been captured in FEMA's data. There is concern that some of these areas coincide with areas populated by lowincome residents, people of color, and residents whose first language is not English, posing additional environmental justice concerns. Concerns were raised regarding how to ensure that buyers are informed during property transfer of the risks associated with certain locations that may be prone to flooding, or where repetitive losses have been identified.

Environmental Justice Communities and Vulnerable Populations

Workshop participants expressed concern about the impacts of climate hazards on a variety of Environmental Justice communities and vulnerable populations in Framingham, including low-income residents and residents whose primary language is not English, seniors, the homeless, and individuals with respiratory issues. Identifying and reaching vulnerable populations can be a challenge, especially those who may no longer have a land-line telephone, homeless individuals without an address, or those who may not self-identify as vulnerable. Certain populations, such as seniors and people with health or income constraints, are known to be at higher risk during hazard events and may require support beyond emergency notifications. Paul Landers, from the Framingham Housing Authority, noted that many of the senior residents won't call for help when they need it, but also have a tendency to panic during hazard events. Workshop participants expressed concerns about these populations' ability to obtain food and medical supplies during hazard events, the risks from diseases that may be exacerbated by certain climate change impacts such as extreme heat, as well as the challenges involved in getting individuals (especially seniors) to leave their homes (and sometimes their pets) in order to seek shelter elsewhere. Participants also noted that Framingham has a high rate of residents whose first language is not English. These language barriers place extra demands on the City's services and emergency response capacity. These numbers may further increase if additional individuals from surrounding communities migrate to Framingham after being displaced by climate change. Better understanding Framingham's vulnerable populations and their distinct communication needs is essential to the City's emergency preparedness and planning efforts and to successful coordination with local civic organizations that support these populations.



Communications Systems

The City deploys a Rave/Reverse 911 alert system during emergency situations, which sends emergency alert messages to anyone with a home phone or a smart phone registered with the system. All citizens and businesses are encouraged to register to receive alerts. A question remains whether critical communication services like this can reach everyone with consistent and reliable information, especially homeless populations, residents without a cell phone or landline, and residents who speak a primary language other than English. Existing social organizations in the City complement and bolster the formal communications system by coordinating on-the-ground information gathering and sharing strategies to reach more citizens. Insufficient communication between these entities and the public as well as internal communication break-downs within City departments is recognized as an issue that may hinder the effectiveness of the City's communication systems.

Provisions, Fuel, and Medical Care

Maintaining access to essential supplies like groceries and medicines, as well as social services like mental health care, and fuel (for vehicles, home heating, and generators) was a concern for workshop participants. It was acknowledged that power outages or road closures, which affect access to these services, could have extensive impacts on residents throughout the City. These issues are exacerbated for vulnerable populations, including individuals depending on oxygen, refrigerated medicine, or energized devices for maintaining their health.

Shelters

Emergency shelters can be vital to public safety during hazard events, with both extreme temperatures and rising floodwaters being the typical drivers of shelter use (though charging stations for phones are increasingly important as well). As the City's Police Chief and Emergency Management Director stated, "what keeps me up at night is sheltering." The City is able to have a shelter open and fully staffed within an hour to an hour and a half, but shelters are very expensive to run and often underutilized. The chief noted that the last time the shelters were opened, four facilities were opened and only one family total made use of them. The Callahan Senior Center was set up as a warming station about a year ago, but only six people came, in part because the power outage prevented people from getting the message that the shelter was open. The serious flooding of 2005 was the last time that shelters received any heavy utilization. Emergency personnel typically coordinate the Council on Aging to determine whether the City's senior population will need shelters during any given event.

Stress on Emergency Services

Framingham's Fire, Police, and Public Works departments bear much of the burden of responding to the increased human threats that result from climate-induced hazards. An ever larger percentage of the departments' time and resources are being devoted to handling things like traffic accidents, clearing roads to maintain access and traffic flows, activities to protect property, ensuring residents' safety, and aiding overall recovery efforts. The Fire and Police Departments know the City's flood-prone areas and respond effectively. Coordinated emergency response between the Fire and Police departments and ambulance service was also described as strong. However, staffing and equipment needs exist among the departments. It was also acknowledged at the workshop that climate impacts may disproportionately impact low-income neighborhoods or homeless populations, with the potential to overwhelm support services. Municipal facilities need to be strengthened with critical communications technology to safeguard municipal communications between departments and with the public in an emergency event.

Schools

Framingham's schools and student population are affected by a variety of hazard types. While the City has some newer schools, many of the City's occupied school buildings were built in the 1950's and 1960's and



are reaching the end of their service lives, making them increasingly difficult to maintain. The buildings' external envelopes require increasing maintenance to keep stormwater and snowmelt out. A study has been done which indicated that at least a \$2 million investment will be needed over the next few years in order to maintain these aging buildings. Some of the City's schools are also located in or near floodplains and are susceptible to flooding, including Fuller Middle School. Schools are increasingly forced to cancel classes due to snow and ice events or extreme cold that make it impossible to safely get the City's students to and from school. This, in turn, extends the school year further into the summer, which exacerbates the risks that school will be in session during extreme heat events. Matt Torti, Director of Facilities for Framingham Public Schools, noted that seven of the City's schools are occupied throughout the summer for some type of programming, making cooling increasingly important. As days above 90 degrees increase, heat stroke is a concern for the student population at those schools without air conditioning, and for student athletes practicing outdoors. The City feels pressure from both staff and students to respond to these concerns, and is working to appropriate capital funds to implement air conditioning. At the high school alone, this is expected to cost approximately \$1.2 million. This would not only benefit students in class during the summer, it would potentially allow the City to offer more cooling centers for residents during heat waves, as these schools already act as emergency shelters.

Pests and Disease Control

Climate change is affecting pests and disease vectors both through changing precipitation conditions and changing temperature conditions. Warmer, wetter conditions lead to increased mosquito populations, while the absence of sufficient periods of cold means that pest populations that would historically have been killed off or reduced are able to survive the winter and emerge in greater numbers the following season. Further, as the Massachusetts climate begins to look more like that of the mid-Atlantic and southern states, we are seeing new types of diseases show up in existing pests (e.g. mosquitoes carrying West Nile Virus, Eastern Equine Encephalitis (EEE), or Zika and ticks carrying Rocky Mountain Spotted Fever). 2018 marked the Commonwealth's highest ever incidence of West Nile Virus diagnosis, which is a more urban vector-borne illness than EEE. These changes present a major public and animal health challenge in terms of education, prevention, and treatment. As Sam Wong, the City's Director of Public Health, noted during the workshop, "I see ticks everywhere;" these pests are increasingly prevalent in the City's parks and trails, and complaints and reports of abnormal tick-borne diseases are on the rise in Framingham. The City feels there is a need to educate its residents about precautions against contracting vector-borne illnesses and to explore environmental strategies, like protecting undeveloped areas and providing more landscape buffers, in order to reduce human exposure to pests. The City received extra MVP funding to further investigate specific actions that could be taken by the City of Framingham Health Department to build capacity to address current and anticipated public health concerns regarding tickborne illness given the current and anticipated increase in exposure to tickborne illness as a result of climate change.

Economic Development

Framingham has a unique role in the larger Metro West area, due to its geographic position, transportation access, and attractiveness to business. The City's connection to Boston is vital to maintaining this thriving economy, so maintaining physical access between Framingham, Boston, and other surrounding communities during hazard events was a key concern for workshop participants. While continued economic development is desired, there was also recognition among workshop participants that development has created additional impervious area and associated stormwater runoff pressures. On the other hand, some participants noted that new stormwater management requirements can be frustrating for developers seeking to bring new business to the City. In one example, it was noted that a \$10,000 repair might trigger a requirement for an \$80,000 stormwater system, making it difficult to make improvements that are attractive to corporate tenants. More generally, there was a perceived need to be deliberate about considering where future development should be encouraged and to consider how to



also preserve pervious areas and maintain the character of existing neighborhoods and the sense of community which currently draws people to Framingham.









Current Strengths and Assets

While the City recognized a number of vulnerabilities, workshop participants identified key strengths as well. Framingham has a number of systems in place to facilitate emergency communications and help ensure that emergency services can be provided in a wide range of conditions.

- Framingham has a **strong sense of community** that attracts residents and businesses.
- Framingham employs **pavement temperature monitoring** and other best management practices to optimize its snow and ice management program.
- **Schools have many resilient features**, including a strong IT communications network, situational awareness practice, and outreach programs to parents during emergencies.
- The City is in the process of installing air conditioning in some City schools.
- Framingham last updated their Multiple **Hazard Mitigation Plan** in 2017.
- **City Hall has a back-up generator** to ensure that power to the City's IT and 911 hubs housed there is uninterrupted during power outages.
- Framingham has **five Fire Stations** that are well-positioned to respond during hazard events, and coordination among emergency services is strong.
- The City has many **portable generators** that can be deployed at critical intersections and multiple buildings, including warming and cooling centers, during emergencies.
- The City operates a **Rave Emergency Alert system** that is used to share information relevant to short-term hazards or expected long-term hazards.
- Framingham has a wide variety of **emergency services equipment**, including snow equipment, ATVs, signs, and a Storm Room.
- The Police Department Headquarters is home to the Emergency Operations Center.
- Several **emergency shelters,** including most schools, are available during hazard events and can be fully deployed within 1.5 hours of an event.
- Framingham is home to MetroWest Medical Center.
- Framingham Operation Center is ready for activation during City-wide or large scale emergency events.
- The City is working on **a new open space plan**, with a priority focus on acquiring properties for flood storage.



- The City is part of MWRA with access to **multiple water sources** and **established a water conservation program**, increasing drought resilience.
- The City has robust **public transportation resources** through the MWRTA.
- The state-owned commuter rail, with stops at Framingham and West Natick, improves mobility
 for the City's many residents, which is important for emergency management and connectivity to
 Boston, Worcester, and Logan Airport.
- The City is exploring installation of a photovoltaic carport at Fuller Middle School.
- The City's **Housing Authority** has back-up generators to power emergency lighting and elevators, and a community room with A/C.
- **Framingham State University** is a resource for training students and community members about sustainability and climate change through curricular activities. It adopted a **Climate Action Plan** in 2018 to reduce its greenhouse gas contributions.
- The City has invested **in energy efficiency technologies**, such as LED lights to serve its facilities, parking lots, and streets, resulting in cost savings and lower energy use.
- The City of Framingham is a certified **Green Community** and has adopted the stretch energy code.
- Framingham has resources available in multiple languages, including a multi-lingual City
 website, radio offerings in several languages, and translation capability available in the Mayor's
 office.

Top Recommendations to Improve Resilience in Framingham

Participants at the CRB workshop identified a number of recommendations to address vulnerabilities and increase resiliency in three main topic areas: infrastructure, environment, and society. Management of water, from stormwater runoff from impervious surfaces, to flood storage capacity, to the quantity and quality of public drinking water, was an overarching concern that emerged in both the small and large group discussions. Improving undersized or deteriorating infrastructure systems was a second major theme. Finally, much attention centered on communicating with and providing services to the City's residents during hazard events, with particular focus on vulnerable populations.

Highest Priority

• Conduct a field inventory of culverts and bridges to rank and prioritize projects for increased flooding resiliency and storm-hardening, followed by design and implementation of priority resizing or replacement projects. Green infrastructure, Low-Impact Design, and other nature-based solutions will be integrated with hard-infrastructure improvements to establish approaches that will be robust in the face of natural hazards and climate-change scenarios. Priority areas include



the Route 9/126 intersection, the CSX culvert near Landham Pond Dam, and the Singletary Lane culvert.

- Conduct a flooding study of the Walnut Street neighborhood to assess flooding impacts in more detail and identify potential flood mitigation projects. Note that flooding in the Walnut Street neighborhood is connected to Route 9/126 flooding, so a larger watershed approach may be appropriate to best address these related issues.
- Acquire the CSX corridor and implement next steps to develop the Bruce Freeman Rail Trail
 at the site. Address problems related to historically undersized culverts and neighborhood
 flooding. Partner with the Town of Sudbury to develop acquisition and trail development plans
 through a regional approach.
- Assess flood-proofing measures and flood storage to prevent future flooding at critical facilities, including the Callahan Senior Center and Fire Station #7.
- **Perform a risk assessment of vulnerable pump stations** and establish priority actions for reducing potential flooding impacts, including consideration of nature-based solutions or green infrastructure approaches. Establish emergency back-up plans for the pump stations. Continue to implement improvements to reduce infiltration and inflow.
- Assess drainage infrastructure and drainage-driven road flooding and develop green infrastructure solutions for stormwater management to be used in tandem with improvements to the outdated and undersized stormwater system to reduce road flooding and problems with ice slicks that make roads dangerous or impassable during hazard events. Develop a list of specific priorities, assess feasibility and cost, rank priority projects in terms of climate resilience potential, and develop concept designs for key projects. For linear projects along the City's roadways, consider utilizing green infrastructure design resources developed for other parts of the region, such as the Rhode Island Department of Transportation's Linear Stormwater Manual, released in 2019.
- Implement recommendations from the feasibility study for removal of Landham Pond Dam, including purchase of the rail corridor and removal or rehabilitation of existing culverts.
- Evaluate satellite locations to supplement DPW operations center and salt storage in order to provide better support City-wide and reduce response times.
- Implement plans to install air conditioning in Framingham schools that currently lack A/C, with the high school as the most immediate priority. Include any necessary upgrades to the electrical infrastructure to allow for the additional capacity required to run air conditioning systems. This will also expand the number of public buildings available for cooling stations.
- Plan and post neighborhood and regional evacuation routes, with particular attention to the
 needs of homeless and elderly populations and Environmental Justice communities. Consider
 feasibility of installing second parking lot entrance/exit from Callahan Senior Center to allow use
 as a warming/cooling center, including whether proximity of the lot to the nearby bridge will allow
 for this improvement.
- Evaluate opportunities to provide emergency backup power to critical facilities, including feasibility of green power and battery storage. City-wide, there are a number of buildings and



facilities (including substations, schools, Framingham Housing Authority properties, etc.) in need of backup power systems that could be tied to renewable or alternative energy sources to protect public buildings and infrastructure from freezing and improve services for residents who may lose power during emergencies or hazard events.

- Assess additional mosquito/pest control options, including increased stormwater BMP
 maintenance, integrated pest management approaches, determination of future risks due to
 increase in type and quantity of pests/disease vectors due to climate change, and continued
 development and implementation of education and outreach programs.
- Conduct a feasibility study to evaluate development of a stormwater utility.
- Identify vulnerable populations and foster an improved communications network in advance of a hazard event to facilitate communication efforts and outreach to those most in need of information and assistance. Evaluate feasibility of a combined Fire/Police/DPW dispatch. Utilize networks of existing groups to encourage communication efforts led by churches, schools, social groups, or City agencies. Focus should be on populations that may be more vulnerable to climate-induced risks, such as extreme temperatures, may lack appropriate shelter during increasingly intense storms, or that may be unprepared if stranded or cut off from supplies due to flooding or storm events. Residents of South Framingham were a particular concern with regard to potential language barriers and ability to access transportation resources during hazards. Determine which other communities and populations are most likely to be impacted by different hazards and assess specific translation needs for messaging. Develop a plan to overcome internal communication barriers within City departments and between the City and community partners or residents. Improve outreach and education efforts to ensure City residents, especially vulnerable populations and residents for whom English is not a first language, can access accurate and up-to-date emergency information, shelters, heating and cooling centers, evacuation routes, provisions and services during emergencies. Identifying opportunities to improve the resiliency of our communications networks, such as with local cell towers, will improve the effectiveness of outreach efforts in emergency events.
- Improve the resiliency and passive survivability of local buildings and facilities through
 energy efficiency and adoption of clean energy. Implement renewable/alternative energy
 technologies and energy efficiency measures in new and existing facilities across the public and
 private sectors to assist in reducing the impacts of extreme temperatures encountered in
 heatwaves and freezing periods, minimizing the strain on electric grid and other fuel sources
 during such hazards, improving the reliability energy-using equipment, and mitigating the local
 contribution to climate change and the prevalence of associated impacts.





Moderate Priority

- Develop and implement plans for ecological restoration at Beaver Dam Brook.
- **Conduct a study of flooding along Beaver Dam Brook,** focusing in particular on the Second Street and Taralli Terrace Bridge area.
- Design and implement flood mitigation and drainage improvements in the Hemenway neighborhood.
- Assess levels and sources of stream contaminants in floodplain areas. Build on knowledge of
 existing problem areas (e.g. 350 Irving and General Chemical) and locate other above- and belowground sources with potential to contaminate floodwaters.
- Conduct a comprehensive assessment of water quality, supply, and infrastructure, including assessment of aging infrastructure, such as the MWRA aqueducts. Examine potential for incorporating homes with private wells (particularly in the northwest portion of the City) into the City water supply system. Explore means of mitigating climate-driven impacts on public water supply sources, such as harmful algal blooms or drought.
- Assess public and private dams and develop designs for improvements/replacement where necessary. Assessment should include updating information on ownership and gaining an understanding of condition, as well as determining risks and priority projects. Saxonville Dam, though privately owned by Saxonville Mills, was raised by workshop participants as a specific area of concern. Coordinate with private dam owners to determine where viable partnerships may exist that would provide important flood mitigation benefits to the City.
- **Develop a City-wide comprehensive tree and forest management program** to identify, remove, and replace problem trees, preserve intact forests and street tree cover, provide guidance and resources for gradually moving toward more climate-resilient trees and forest communities (e.g. species that will tolerate warmer temperatures) and develop guidelines to manage conversion of forest land and require shade tree plantings in new developments to promote erosion control and improved infiltration
- **Establish a water conservation program** to reduce MWRA purchases and increase drought resilience for residents and the City.



- **Develop comprehensive plan for beaver management** to mitigate against unpredictable flooding/impoundment impacts. Establish creative engineering solutions, identify suitable areas for beaver relocation or where beaver activity may be creating flood storage that contributes to resiliency, and consider the development of special legislation to give the City authority to address problematic beaver dams on private property. Evaluate permitting feasibility of beaver deceivers or other non-lethal methods to mitigating the flood impact of problem beavers in flood-prone areas.
- Continue upgrading aging traffic control systems with more energy efficient and resilient
 options such as low voltage LED lights with back-up power supply to maintain normal traffic flow
 operations during power outages.
- **Develop a City-wide Business Resilience Plan** to support local businesses and make the business community more resilient. Identify business development areas where impacts from climate hazards can be easily avoided or mitigated (e.g., by avoiding floodplains or areas of known drainage-related flooding) and targeted improvements, such as a microgrid and rooftop solar installations, employed to provide extra resilience to community businesses in the Downtown and I-90 Exits 12 and 13 areas. Evaluate feasibility of a carpool lane to these key exits.
- Conduct a microgrid feasibility study to investigate the possibility of localized power for critical
 facilities and ensure that electrical services continue when the primary power grid is disrupted by
 a hazard event. Identify and implement measures to prepare municipal facilities and operatiosn
 to be more energy independent, including repairing/replacing rooftops in order to support solar
 energy systems and adopting alternative fuel vehicles.
- Partner with electric and gas utility providers to identify and address vulnerabilities in utility
 infrastructure and enhance communication and cooperation between the City and private
 utilities. Continue to coordinate tree maintenance to increase resilience to severe weather.
 Continue to utilize programs and resources offered by utilities and their associated service
 providers to improve energy resiliency for municipal facilities as well as residents and local
 businesses.
- Coordinate regional management efforts of Lake Cochituate, including studying ways to reduce pesticide and nutrient inputs from stormwater runoff. Efforts can include public outreach and education.
- **Update flood mapping** throughout the City to ensure that residents and businesses have the most accurate information regarding risks and the need for potential mitigation strategies.
- Conduct robust transportation resiliency planning to ensure that access is maintained in and out of the City and throughout the Metro West region during hazard events. Focus on 1) facilitating emergency operations, 2) studying key junctions such as Exit 13, Exit 12, and the Route 9/126 intersection, and 3) considering approaches to improve and promote public transportation to help reduce cars on the road during inclement weather and reduce greenhouse gas emissions.
- Assess feasibility and funding options for property acquisitions along the Sudbury River and other flood-prone areas in the City with the intent of providing relief for property owners facing potential flood risks or repetitive losses and increasing available space for floodplain restoration to reduce flood impacts.



 Coordinate with Framingham State University, MassBay Community College, and local community organizations to develop educational messaging and/or programming to transfer climate change risk and vulnerability knowledge to the general public, especially future generations.

Lower Priority

- Continue to support coordinated efforts to provide emergency shelters that effectively serve
 Framingham's population during hazard events, including cooling and warming centers. Begin a
 City-wide discussion about informal sheltering to better understand how and when residents
 might use shelter services and redefine 'sheltering' to meet Framingham's specific needs. For
 instance, if primary shelter use is for charging stations, develop locations where residents can
 meet this need during power outages without the expense of opening formal shelters. Consider
 how to support the use of informal sheltering locations where people already go in emergencies.
- Evaluate feasibility of City ordinance for private maintenance of problem trees. Such an
 ordinance can help increase utility resilience by reducing branch and tree falls during severe
 weather.
- Explore and evaluate means of improving resiliency at historic properties throughout the City.
- **Identify financial and technical assistance for MS4 implementation**, to support municipal departments in complying with the MS4 permit.
- Investigate potential for setting up and funding an emergency fund to support financially vulnerable populations during climate change related hazards and emergencies. This could include a surcharge on tax bills.
- Collaborate with the state women's prison, MCI-Framingham, to evaluate potential climate
 impacts related to hazard events such as flooding, drought and extreme heat. Assess resiliency
 of the prison facility.
- Coordinate with MWRTA and MBTA to assess resiliency of commuter transportation, with
 particular focus on minimizing susceptibility to climate hazards and ensuring continued
 operations. Incorporate assessment of increased ridership and expanded offerings that would
 better connect employees with key business centers.
- **Communicate with MEMA** regarding the vulnerability of its command center and make efforts to increase the resiliency and safety of state emergency operations.
- Facilitate education for prospective homebuyers and realtors to address flood risks to
 make sure that buyers are aware of what it means to purchase a home that may be located in or
 near a floodplain and educate residents on protections such as flood insurance that can mitigate
 financial risks associated with climate hazards. Target landlord associations and realtors to
 encourage risk communication.



CRB Workshop Participants

All workshop invitees are listed below; attendees are indicated with an asterisk.

Name	Position/Organization	
Karen Adelman*	MAPC	
Jim Barsanti*	City of Framingham, DPW, Water/Wastewater	
Doug Bidlack*	East Middlesex Mosquito Control Project	
Bob Bois*	Framingham Conservation Commission	
Emily Collins*	Carmel Terrace	
Tania Diduca*	SMOC	
Ronit Goldstein*	Eversource Energy	
Jeff Gomes*	MassDOT	
Dale Hamel*	Framingham State University	
Joseph Hicks*	Framingham Fire Chief	
Marianne larossi*	City of Framingham, City Planner	
Nathalie Jean*	City of Framingham, Community & Economic Development	
Thatcher Kezer*	City of Framingham, Chief Operating Officer	
Paul Landers*	Framingham Housing Authority	
Anne-Marie Lambert*	Belmont resident	
Shawn Luz*	City of Framingham, Sustainability Coordinator	
Ariel Maiorano*	Mass Audubon	
Robert McArthur*	City of Framingham, Conservation Administrator	
Mike McCarthy*	St. Patrick's Nursing Home	
Kelly McFalls*	City of Framingham, Public Information Officer	
Hillary Monahan*	MWRA	
Grace O'Donnell*	City of Framingham, Council on Aging	
Aimee Powelka*	Sustainable Framingham	
Kerry Reed*	City of Framingham, DPW, Stormwater Engineer	
Arthur Robert*	City of Framingham, Community & Economic Development	
Maria Robinson*	State Representative	
Kate Ronconi*	City of Framingham, DPW, Highway/Sanitation	
Maria Rosado*	Pelham Apartments	
Jim Snyder*	City of Framingham, Parks Director	
Yvonne Spicer*	City of Framingham, Mayor	
Matt Torti*	Framingham Public Schools	
Steve Trask*	City of Framingham, Police Chief	
Emily Van Dewoestine*	MWRTA	
Marc Verreault*	Carruth Capital	
Alex Volfson*	Transition Framingham	
Sam Wong*	City of Framingham, Director of Public Health	

^{*} indicates attendees



Citation

Fuss & O'Neill (2019). Community Resilience Building Workshop Summary of Findings. City of Framingham, Fuss & O'Neill, Inc. Springfield, Massachusetts.

CRB Workshop Project Team

Name	Organization	Role
Yvonne Spicer	Mayor's Office	Core Team Member
Marianne larossi	CED	Project Coordinator/ Core Team Member
Art Robert	CED	Core Team Member
Nathalie Jean	CED	Core Team Member
Kerry Reed	DPW	Core Team Member
Sam Wong	DPH	Core Team Member
Dana Haagensen	Fire Department	Core Team Member
Thatcher Kezer	Mayor's Office	Core Team Member
Kelly McFalls	Public Information	Core Team Member
Shawn Luz	Capital Projects/Facilities Mgmt	Core Team Member
Mary Monahan	Fuss & O'Neill	MVP Lead Facilitator
Julianne Busa	Fuss & O'Neill	MVP Facilitator/Scribe
Kurt Mailman	Fuss & O'Neill	Scribe
Tim Clinton	Fuss & O'Neill	Scribe
Stefan Bengtson	Fuss & O'Neill	Scribe

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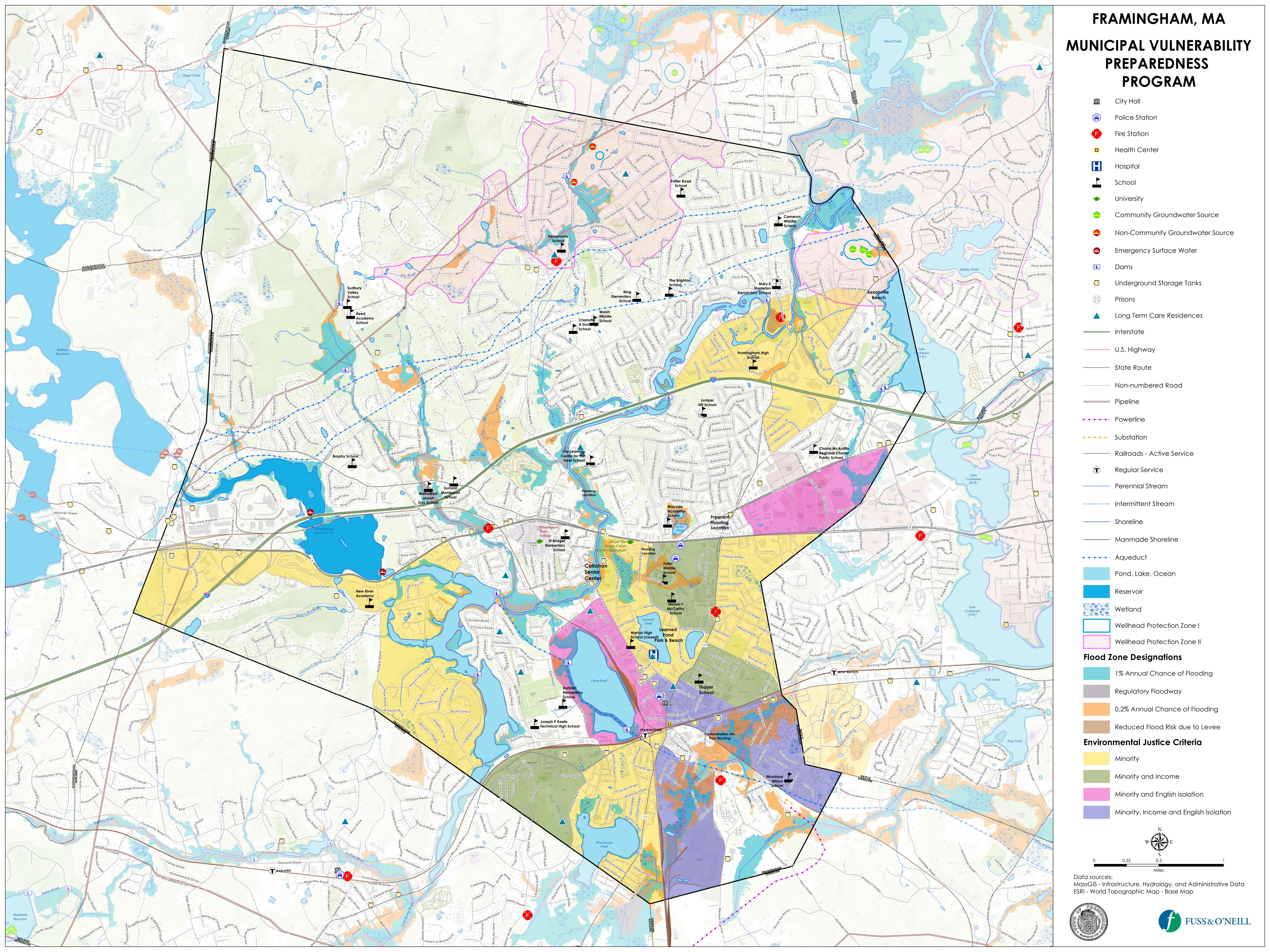
Appendix A

Final Risk Matrix



Appendix B

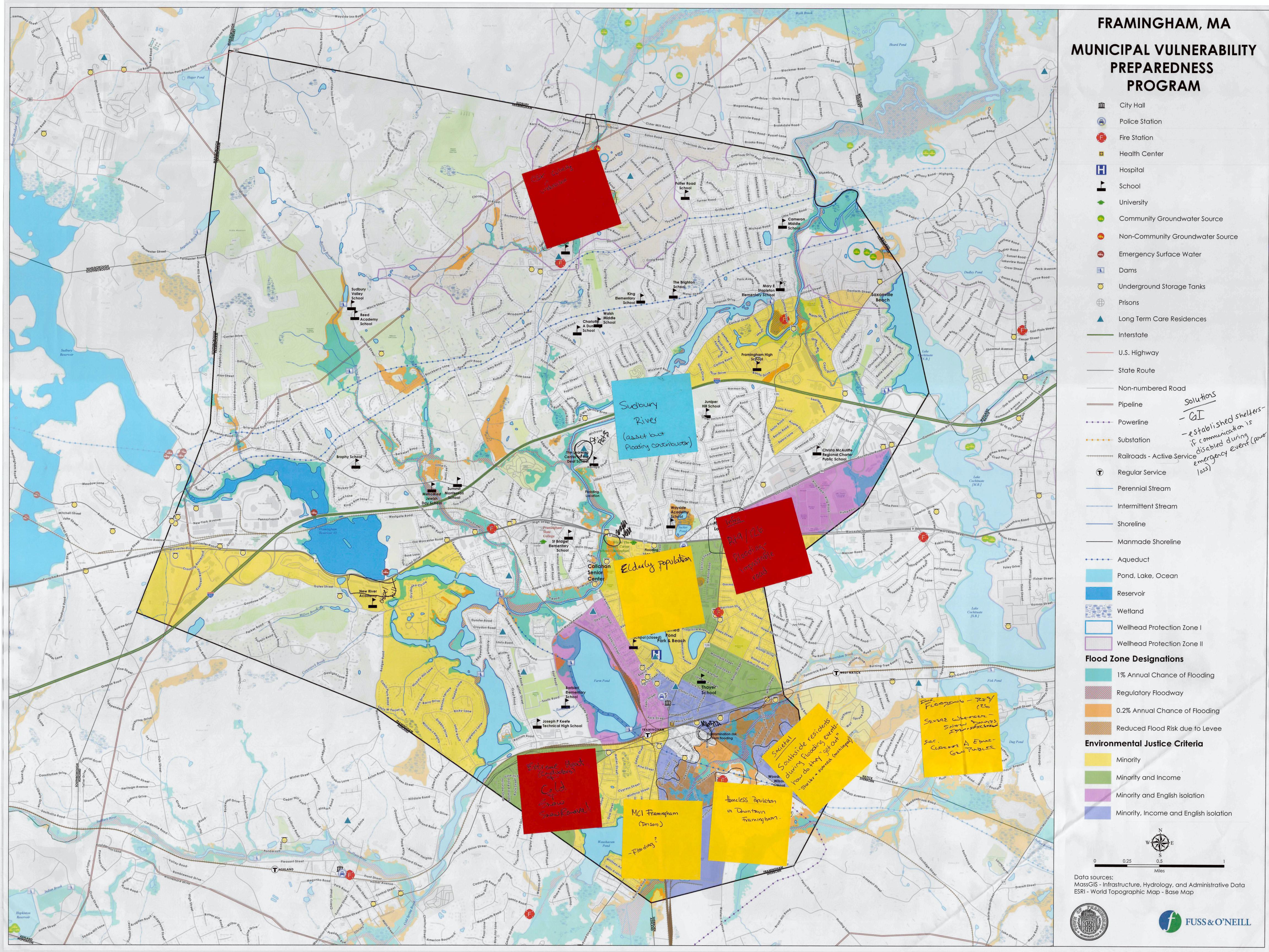
CRB Workshop Base Map

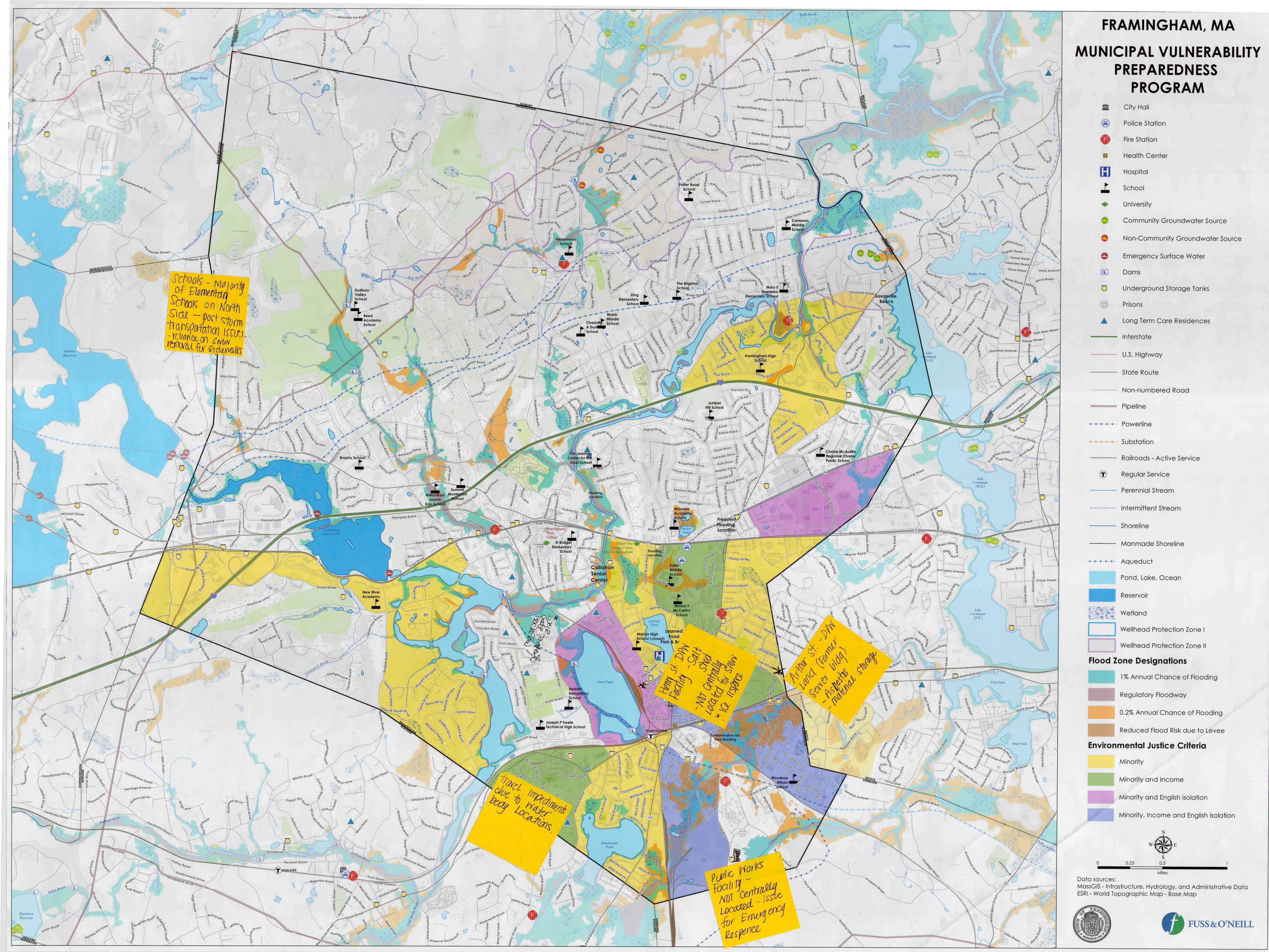


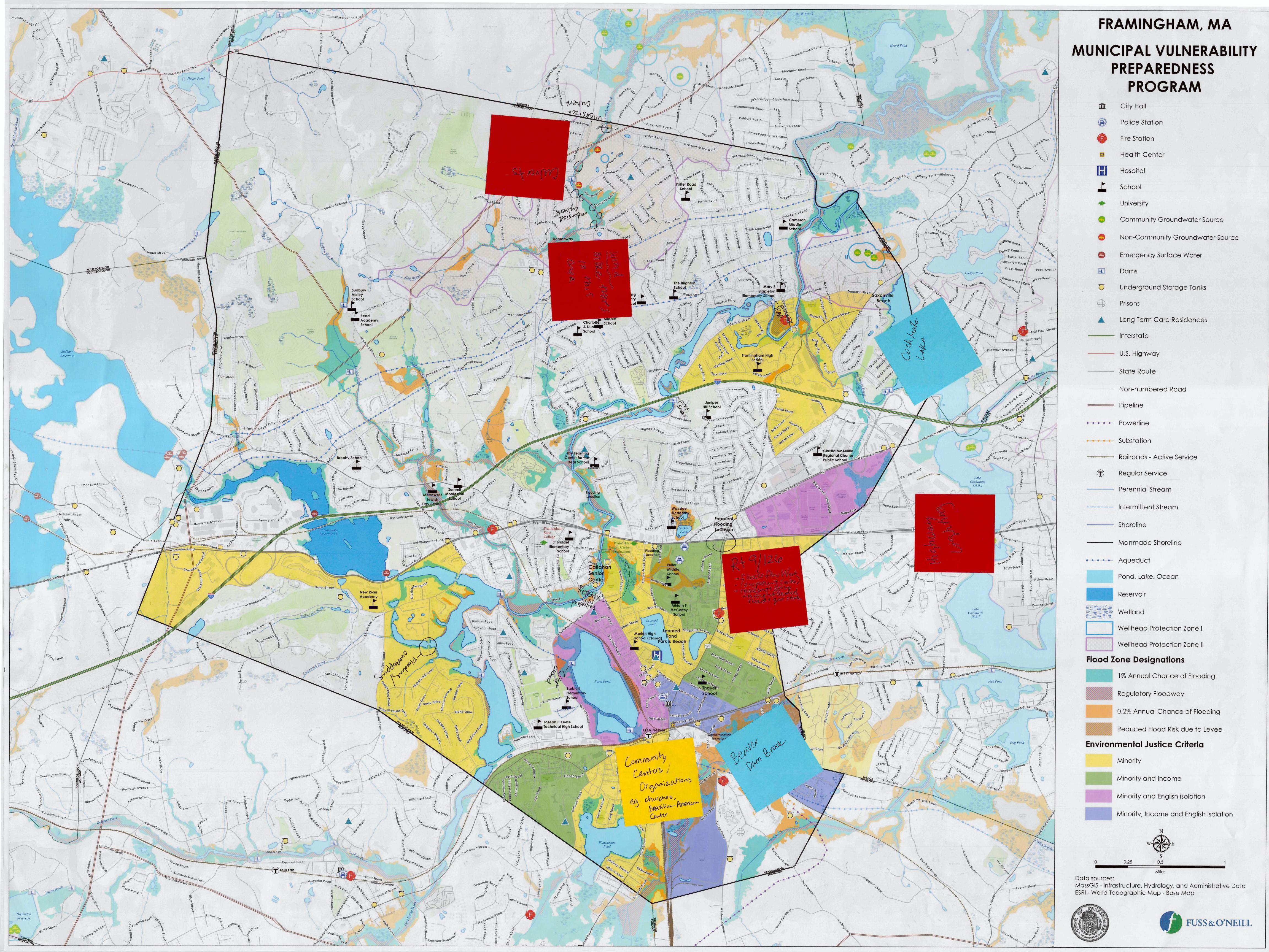


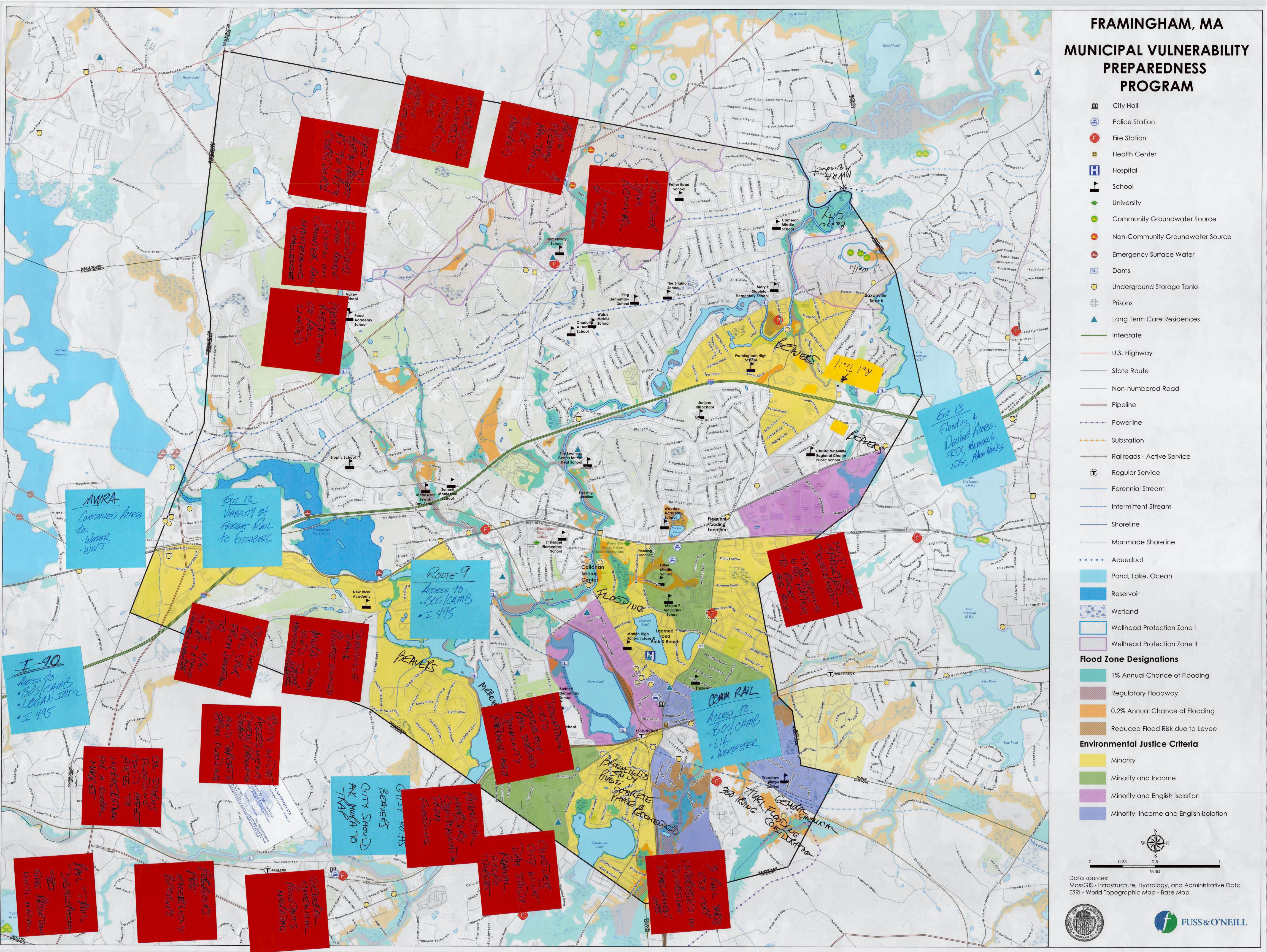
Appendix C

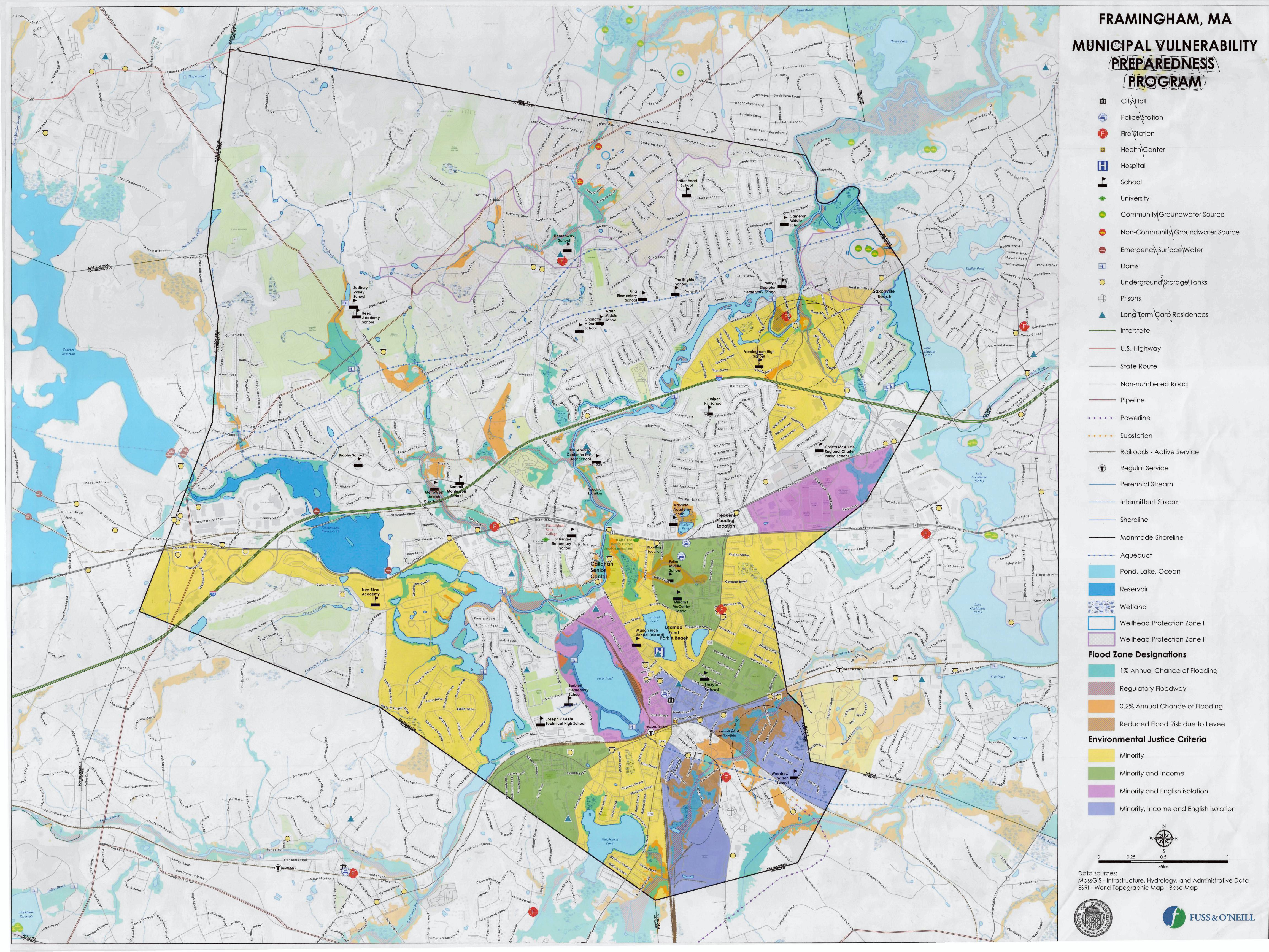
CRB Workshop Outputs: Participatory Mapping Exercise & Risk Matrices

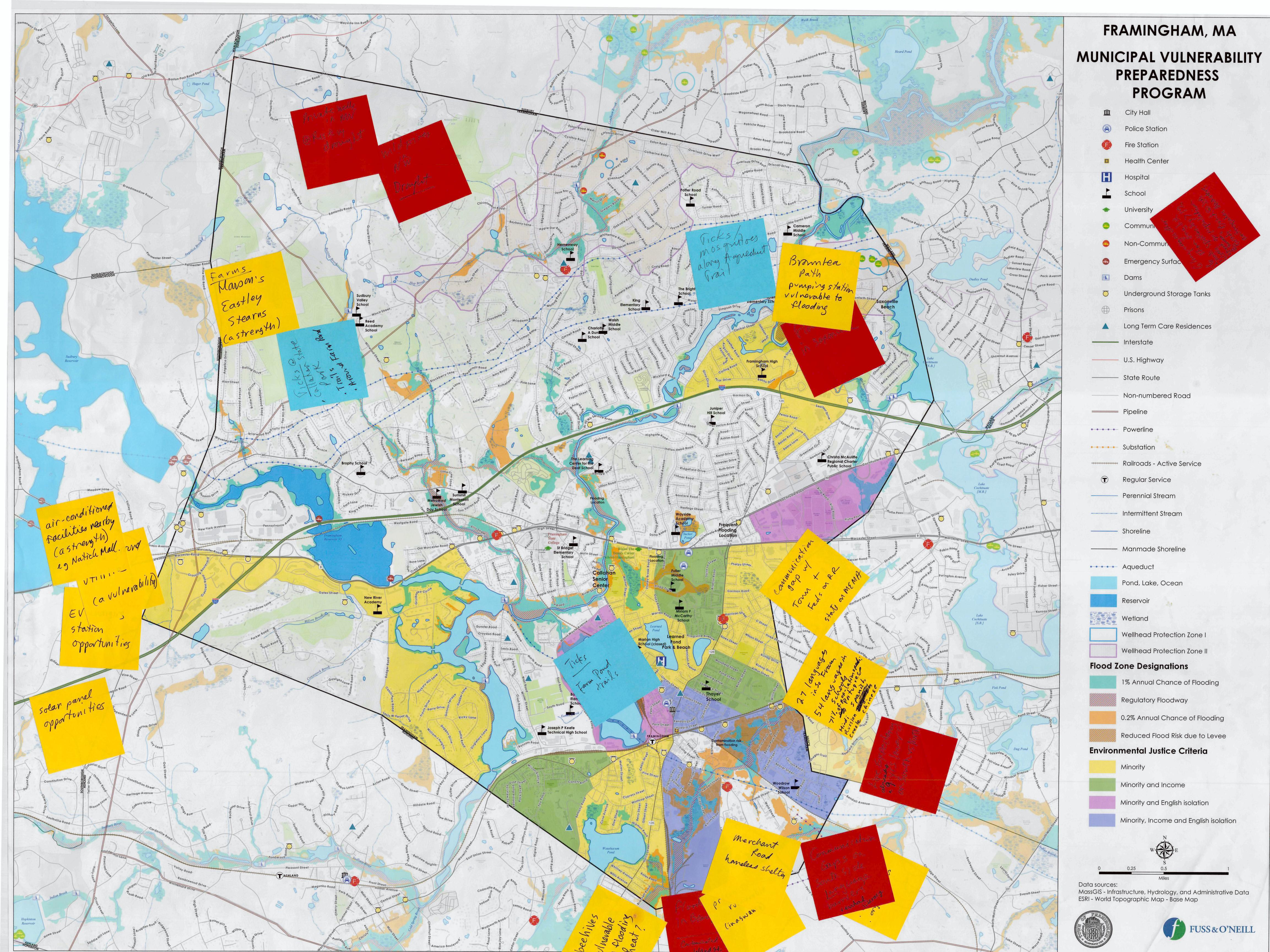














BOTH HAVE DEP ATTENTION

CENERAL CHEM

www.CommunityResilienceBuilding.com **Community Resilience Building Risk Matrix** Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) H-M-L priority for action over the Short or Long term (and Ungoing) Priority $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength Heat Flooding Severe Weather Drought **S**hort **L**ong **O**ngoing Location Ownership V or S **Features** Infrastructural SW/PRAINAGE INFRASTRIRCTURT KANNINE YRIVAEE CITY WIDE INTERCOMECTNIN A COT IS CUWERIS LATING BASET) DANS - SAXONVICE -COPDITION ASSESSMENT CET MOKE INFO FROM DAM OWNER(PRIVATE CBSIRIEKON -LAW DHAM DAM - REMOVAL PUBLIC DANG SCAWALL BILCH METDOW WELLS Public FRAMINGHAM MEEDS AREAT ATTASLE KEED COOKPINATION KAIL - CONFECTIVITY MATTERS PRIVATE MINIMIZE MUSING TO ENSURE OPERATIONAL CONINUTY KAIL TRAILS - MULTI- MODAL GHE RED - DUALITY OF CIFE 1554EP CELIABILITY -MORE INFO FROM MASTRY MASSPIKE WAKEOKE INVOVATION SEATABLE ACCERS TO BOPRON - LOCAL - WEST ELOSYSTEM MBTA - LNOKETBED RDEST DECREASED OR - SHARE/MOTIVATE SOUGHON TO INPOUGH TRATEFIC FLOW EXITIS - ACCESS (KELIANSLE) CIRCUIT DOIS NEED FD - BETTER MANAGE ACCEST SEVERAL INFRANCIENT SEVERIOS AFT 12 - RT9 CAUFORNIA AUS - SOUTHING INC B3- KAIL + STUDY NEEDED - CONSTIDER COMMUTTER LAVE KT 9- FLOODING 124 MUNICA- CRICTAL INFRASTURE - ENTHANCED DISCUSSION RE CO THREATS **Environmental** 13 EAUERS MERH BOUHOUTS /CHOMINISCING TO WETCHND STORAGE DECIEURS OPEN STACE PRESERTION - FOUIRING PROPS UFE MORT REPORT (RED FLOOD STORAGE - AGUIRES PROPILES IN OPEN SPACE AM BEAVER ST APPS - CONSIDER AGUISIDOR TOXIC USE BOUCTION - WHERE DO-FLOOD WATERS GOT - DIRRIBUTE PALLUTANTS - STUDY AND ASSEST MARY DENISON PAKK -390 IKUING - CONSTITUER GRU POWER GENERATION OF POTENTIAL CONT TO BEAVER BROOK - NEEDS MORE ASSESSMENT

1. Response 322 (V) www.CommunityResilienceBuilding.com **Community Resilience Building Risk Matrix** 2. Space Nuds Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) **H-M-L** priority for action over the **S**hort or **L**ong term (and **U**ngoing) 3.5/W lof/ $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength SEVERE FLOODING EQUIP DROUGHT HEAT Short Long <u>H</u> - <u>M</u> - <u>L</u> WEATHER **O**ngoing Ownership V or S Location **Features** STATIONS Higher Flows II I Infrastructural Dower outages - Pump Stations (50)
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Road closures / Equipment Stormwater Evere Snow-Ice events
wall reguining Lg Scale
res ponce/sustainabile wark-Access Itraffic City-mide DPW Roadway > Alt. Frecze/than cycle > excessive potholes/loadway damage Social Social Procurement/Administrative Manage Growth Mange Grawth Private Property brinkto brobart CHymle V/5 GHN MA protolops / primal & princs Stormweter mgt Strumeta management Response / Work fora MII DOBYS Bespies / Markfura 211 Cityling Asset Mongement Investment Show Shows Showing Sho **Societal** Economic - Flood Insurance No refrere for residents/ NO Ale Beaver Brook Private Communication / Language Barner / outreach

Health - promote pests/Lats
(Low Income)

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> trees City-mide Trees - Yayin Edikatuns > Rain Gardens various Locations Parks Dept. conteminetions from Saxnnile Increased Use Increased Vso Liberation (Bankand Rec) VIS Pank Beach Forests (Rank & Rac) NIZ Multiple Park SANGER/THOMPSON/PEARL - Uncler Park S/W Storage Capacity

Community Resilience Building Risk Matrix



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Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) H-M-L priority for action over the Short or Long term (and Ungoing) Priority $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength SEVERE HEAT FLOODING DROUGHT Short Long <u>H</u> - <u>M</u> - <u>L</u> WEATHER **O**ngoing Location Ownership V or S **Features** Infrastructural Rtc 9/126 More storage States flooding Mass DOT Mass Nor 165? low voltage 1/ LEP Convert aging in back-up power source to more resilient Major Roads City 1 State Street/Highway lighting & traffic lights Convert aging int. V/S M & Highways large parking lots structures Singletanylow Feasibility study / Alternatives Culverts Retrotit Aging Infrastructure /Historic development City-wide Inventory - Asset Management & Alternative Arnalysis > Retrotit/Replace
Parthership w/ State/aity vodate design/development City / State/ update design/development Stds Private eg. Dot bridge program, TIP, Chapter 90 findin **Societal** Weatherization program for homes Private / Public Raise awareness Efficient appliances & buildings of available programs I Improve/retrofit lights, etc. City - wide 0 (e.g. energy audits, water efficient fixtures, LED lights) Improve/retrofit lights, etc. School Programs Lack of knowledge Private 1 Build public awareness School Magrams

(e.g. mailings in multiple languages, outreach centers/staff to go to public community center, ethically targeted organizations City-mide Neighborhoods Use existing connections/trust to spread awareness of Focus on inderserved populations Non-profits Community Centers/Organizations (e.g. smoc, brazilian-American Center, churches, schools Communication Charging stations, community centers "wherever the generators are..." Neighborhoods Redifing "shelter" + ML Informal Sheltering Framingham's needs **Environmental** Lake Cochituate (Public beaches Framingham/ Natick Improve lake management > regional efforts Mass DCR Dublic information flood plain Private/ Update flood map Ipolated for Flood Mapping target: landlord assoc. tenants M Prepardidness for home/property owners in flood areas Property Tree inventory & Education/
replace ul resilient Public augreness down

Biggest risk for Prine or take down

replace ul resilient Public augreness down

"tree huggers" City-wide Trees V/S Utilities Private/ Outreach w/ language/cultural consideration Southeast Mitigation Beaver Dam Brook t Flood insurance/knowledge Roadowns Public Fram

Community Resilience Building Risk Matrix



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Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) H-M-L priority for action over the Short or Long term (and Ungoing) **Priority** $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength SEVERE HEAT **S**hort **L**ong FLOODING DROUGHT <u>H - M - L</u> WEATHER **O**ngoing Location Ownership V or S **Features** Infrastructural Now Wells, water truck Private Private wells-NW corner bottled water Snow equip, Storm room (ATVs, Emergency Services Equipment (Signs, etc.) Highways, Commuter Rail, MWRTA, 18 Aging Underground Infrastructure (drains, sener, water) City City/state DOT Road Flooding - Rte 9 + 126 # 0/5 V/S State MEMA Bunker Societal Educational lawareness City/State Ticks / Vector-borne disease 0 M Campingn production dentity communication effectiveness. Communications W/ Pop'n in South improve inter-agency communication between city and the prison state Prison identify the special populations Senior Residents/SISab/ed City M Homeless Shelter on Merchant Rd Shelters, warming/Cooling Stations **Environmental** private / City Contaminated Sites VIS Callahan State Park State Install water flow device City M Beavers, Rats, Mice, Coyates (beavers) limit use of fertilizer Blue-Green Algae Bloom (indvorglit) around bodies of water wooden structures eg Howard + concord apts private

Community Resilience Building Risk Matrix



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Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.) H-M-L priority for action over the Short or Long term (and Ungoing) **Priority** Time $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength SEVERE HEAT DROUGHT **S**hort **L**ong FLOODING <u>H - M - L</u> WEATHER **O**ngoing Location Ownership Vor S **Features** Infrastructural approach curverts Snow-designate snow dumps for exects snow R+9/126 2000 ways impassable RIDOT model-capturing sw VIS Coordination W/ MBTA to Dountown State determine delays Commuter Train (SX corridor private (Herremaynhood) Private Fix/upgrade curverts Culverts (undersized/aging) designate snowdumps for excess snow DT/southside Sidewalks How resilient is the Prism to flooding, drought, heat and severe Neather? Women's Prison South & State \$ Societal having Shelter in place ahead of time during power communication loss duras Southof all Southside residents - how do they get out } see also waverly Placoline during extreme weather events Education - re: climate change homeowners/realtors before a property in floodplain is purchased Community -DPW or other to, take homeless Mostly Homeless Population to shelters dountown Notification and communication through Council of Aging 爱品的 See Flooding See Flooding City-wide Elderly Population V/5 **Environmental** marmade water mainly bodies (retention Private/public basins) for west vile masquitoes better maintenance of SWBMPs/manmade Systems 3/0 1 mosquito/tick populations more trees for sw spiles retention - focus on trees, that are good @ alosorbitor better species more better species more tree inventory-keep all Tree Canopy adaptable to drought existing trees hearthy Citywide adaptable to next trees produce cooling shade tare Coz sinks Seek parcels along River for acquisition for Plood Storage Sudbury River expand Floodplain protected areas VS all City-wide Floodplain/wetlands prohibit dev. in Proodplain

Community Resilience Building Risk Matrix



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				Top Priority Hazards (tornado, floods, wildfire, hurricanes, earthquake, drought, sea level rise, heat wave, etc.)								
$\underline{\mathbf{H}}$ - $\underline{\mathbf{M}}$ - $\underline{\mathbf{L}}$ priority for action over the $\underline{\mathbf{S}}$ hort or $\underline{\mathbf{L}}$ ong term (and $\underline{\mathbf{U}}$ ngoing) $\underline{\mathbf{V}}$ = Vulnerability $\underline{\mathbf{S}}$ = Strength								Priority	Time			
				FLOODING	DROUGHT	HEAT	SEVERE WEATHER	<u>H</u> - <u>M</u> - <u>L</u>	<u>S</u> hort <u>L</u> ong			
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PUMP STATIONS	FLOOD ARMS	PUSLIC	~									
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Societal												
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FLOODING IN ET TREETS				BENDER OPK								
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PUBLIC RANSPORTATION							to CHANCE to LESS EXP MORE RESILIENT ST	LCZ				
PHYSICALLY VULNERABLE - INCOME/AGE/TOBAGILITY						*CREATE 2-WAY EGESS AT SOULDE CENTER *COCCEDINATE WIPRIVATE						
PARKETTO PUBLIC TRANSPORT						ENVITES FOR FODL COPZING CENTURS	COORDINTHE W/ MURTA to tad solutions	É	_			
Ceg. Lawrence - lack of personal finds to cope in orthering	9				HEATT ON EXISTING PROGRAM ANDRE ON BILLS TO SUPPORT	Reduce energy bills (eg. Minneapelis)						
Environmental					May be in RE Tox bill in come							
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ESTABLISH WATER CONSERVATION PROBLAM		Howa		0				U	5			
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CROSS TOWN COMMUNICATION
(REGIONAL)



Appendix D

CRB Workshop Presentation Materials







Reservoir No. 2 Dam and Gatehous

Municipal Vulnerability Preparedness Program Community Resilience Building Workshop City of Framingham
March 19, 2019

Community Resilience Building Workshop

<u>Agenda</u>

- CRB Team and participant introductions
- Introduction to Massachusetts Municipal Vulnerability Preparedness Program (MVP)
- Introduction to Climate Change and the City of Framingham
- Discussion by Framingham participants on status of current planning and risks
- Introduction to CRB Workshop process
- Large group
 - Review top four hazards
- Small work groups (Using Risk Matrix)
 - Identify Framingham's vulnerabilities and strengths
 - · Prioritize response actions
- Large group
 - Report out from small groups
 - Determine overall priority actions for the City
- · Discussion on next steps
- Conclusion





Fuss & O'Neill Overview

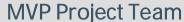


Fuss & O'Neill is a leading MVP consultant in assisting Massachusetts communities secure grant assistance, achieve designation as a Massachusetts Municipal Vulnerability Preparedness (MVP) community, and execute their MVP priority projects.

The MVP team is experienced in local government, environmental services, civil site engineering, stormwater management, and emergency management.

Fuss & O'Neill assisted new MVP communities secure more than \$700,000 MVP Action Grants in the program's first funding round.







Mary Monahan

Mary is a municipal public works specialist well-versed in issues related to stormwater management; wastewater collection and treatment; drinking water supply, treatment, and distribution; solid waste management; and sustainable operations. Mary serves as a liaison between the public works project owner and the design team.

Julie Busa

Julie is an environmental scientist in the Water Environment and Natural Resources group of Fuss & O'Neill. She has over 10 years of experience in the areas of global biodiversity and forest conservation, sustainability, and ecological modelling. Julie works extensively with municipalities on MS4 compliance and the MVP program.



Framingham MVP Program - \$44,500

- Grant Supports Climate Change Vulnerability Assessments and Resiliency planning
 - Comprehensive Approach
 - o Infrastructure
 - o Society
 - o Environment
 - Scope and Process Use the Guidance in the Community Resilience Building Workshop Guide
 - Municipalities That Complete This Process Will Be Designated Municipal Vulnerability Preparedness (MVP) Municipalities

MVP Designation Leads to Enhanced Standing in Future Funding Opportunities

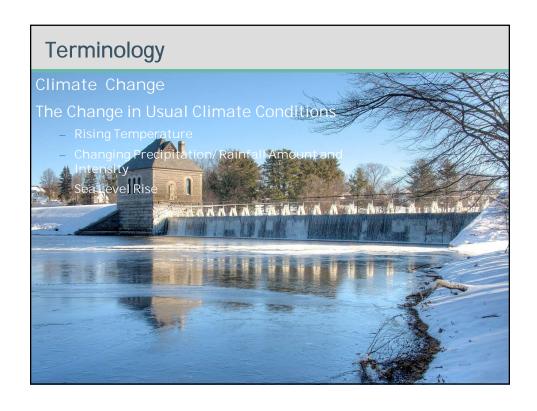


MVP Action Grant NEW

- Grant supports priority actions identified at Community Resilience Building Workshop
- Up to \$2 million available
- Local match of 25% can be in-kind
- April 19, 2019 deadline
- Requires MVP certification

Only those communities which have completed the CRE workshop are eligible to apply





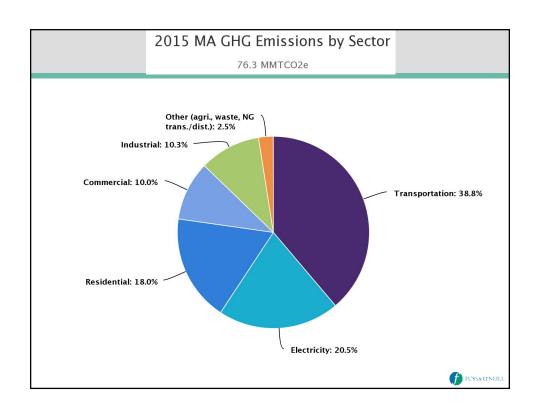
City of Framingham – SuAsCo Basin Sudbury-Assabet-Concord Basin

Rising Temperature

SuAsCo	Observed Baseline 1971-2000	Projected Change			Projected Change in 2050s			Projected Change in 2070s			Projected Change in 2090s		
Average Annual Temperature (°F)	48.73	2.18	to	4.37	2.88	to	6.32	3.47	to	9.03	3.76	to	10.94
Annual Days with Maximum Temperature over 90°F (Days)	8.07	7.24	to	20.03	10.13	to	35.14	12.20	to	56.37	14.48	to	76.25
Annual Days with Minimum Temperature below 32°F (Days)	143.35	-11.90	to	-27.94	-19.26	to	-39.80	-22.36	to	-55.02	-24.35	to	-64.94



City of Framingham – SuAsCo Basin Sudbury-Assabet-Concord Basin **Changing Precipitation** Observed Baseline 1971-2000 Projected Change in 2030s Projected Change in 2050s Projected Change in 2070s Projected Change in 2090s SuAsCo Total Annual Precipitation (Inches) 45.44 0.16 8.01 to 4.84 0.56 to 6.06 1.53 to 7.79 1.23 to Annual Consecutive Dry Days (Days) 16.83 -0.55 1.41 -0.40 to -0.88 2.26 -0.72 2.50



Climate Change Impacts - Temperature

- Economic
 - Winter Recreation
 - Snow and Ice
- Agricultural
 - Longer Growing Season
- Health
 - Increased Pests
 - Heat Stroke
- Infrastructure
 - Road Buckling
 - More Potholes
 - Power Outages
- Environment
 - Change in Habitat







Climate Change Impacts - Precipitation

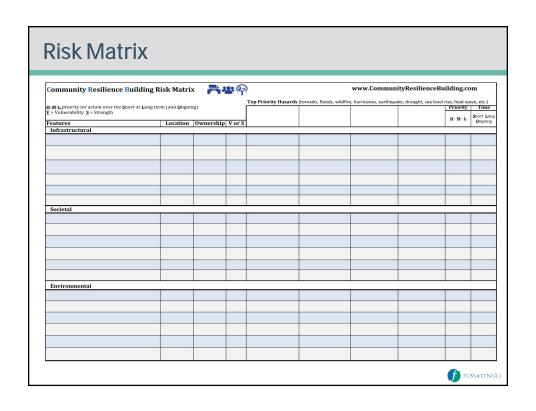
- Economic
 - Dangerous Floods
 - Lost work time
- Agricultural
 - Excessively Wet Spring
 - Drought
- Health
 - Flood/High Water-related Deaths
 - Emergency Response Delays
- Infrastructure
 - Road Washout
 - Environment
 - Sewer System Overflows
 - Compromised Bridges
- Changes in Habitat







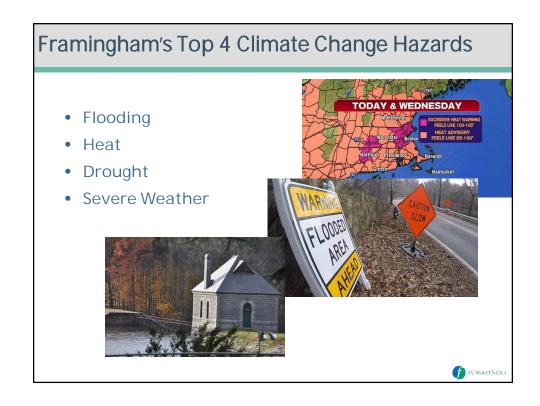




Climate Change Hazards

- Flooding
- Extreme Precipitation Events
- Heat Waves
- Drought
- Snow/Ice
- Wildfire
- Tornadoes
- Hurricanes
- Nor'easters
- Other





Community Resilience Building Workshop

- Review MVP Sectors
- Maps as tool
- List infrastructure, societal, environmental feature
- Determine whether a vulnerability or strength
- Identify actions to reduce vulnerability or reinforce strength
- Prioritize actions
- Report Out

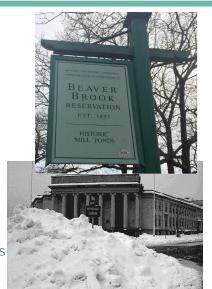






MVP Sectors

- Infrastructure
 - Evacuation routes
 - Schools
 - Roads, bridges, dams
 - Water and wastewater
 - Septic systems
 - Hospitals
 - Commercial Buildings, churches
 - Utilities: electric, gas
 - Factories
 - Emergency management facilities





MVP Sectors

- Societal
 - Emergency shelters
 - Senior housing
 - Schools and campuses
 - Economically challenged populations
 - Evacuation plans
 - Animal shelters
 - Hospitals, pharmacies
 - Grocery stores
 - Utilities: electric, gas
 - Homeless
 - Other







MVP Sectors

- Environmental
 - Drinking water supply
 - Rivers and streams
 - Parklands
 - Agriculture
 - Title V systems
 - Stormwater management
 - Open spaces
 - Flood plains
 - Forest
 - Other







Community Resilience Building Workshop

Next Steps:

Public Review of Priorities Monitor and Update Annual Review



Community Resilience Building Workshop

Questions?

